



Universal Global Scientific Industrial Co., Ltd.
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User Manual

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1. Introduction and Feature

1. Introduction

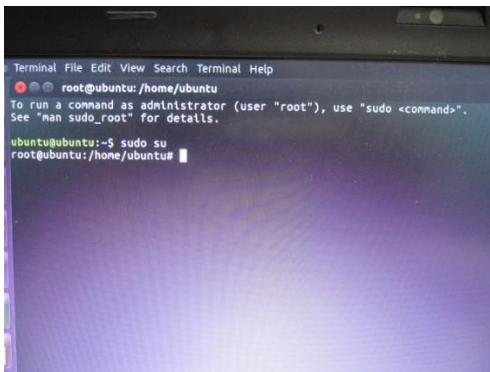
WP1-2020-A1 is 2x2 802.11a/b/g/n/ac dual-band Wi-Fi + BT 5.1 Module. The Wi-Fi subsystem contains 802.11a/b/g/n/ac MAC /Baseband /Radio. The Bluetooth subsystem contains Baseband/Radio/Link controller. The module is a small size module based on metal lid shielding package that provides full function of 802.11a/b/g/n/ac and Bluetooth 5.1 in a tiny module via 75 pins LGA footprint.

2. Feature

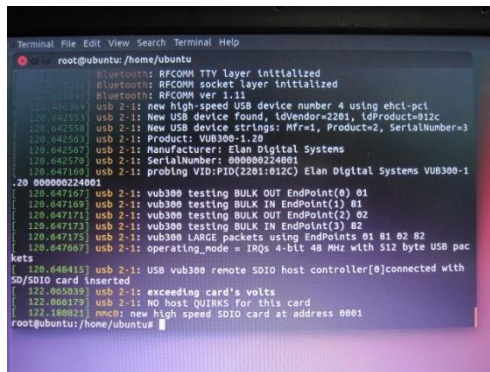
- 1) Full IEEE 802.11a/b/g/n/ac compatibility with enhanced performance.
- 2) Support dual-band 2T2R mode. 20/40M bandwidth in 2.4G band and 20/40/80M bandwidth in 5G band. IEEE 802.11 d/e/h/i/j/k/r/v/w support.
- 3) Support BT5.1 with BLE2M, BLE long range and compatible BT4.2. Support 7 simultaneous active ACL connection and 16 BLE links.
- 4) Frequency Band
 - 2.4 to 2.5GHz
 - 4.9 to 5.845GHz
- 5) Operating Temperature
 - 10°C to 65°C
- 6) Relative Humidity range
 - Less than 60% for Storage
 - Less than 85% for Operation

2. User Mode (WiFi)

1. Boot up PC or NB with the flash installed Linux OS.
2. 5V for EUT from the power supply.
3. Type “sudo su” on Terminal in Linux to get root authority. EUT could be controlled if “mmc0: new high speed SDIO card at address 0001” is shown after typing “dmesg.”



```
Terminal File Edit View Search Terminal Help
root@ubuntu:/home/ubuntu
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
ubuntu@ubuntu:~$ sudo su
root@ubuntu:/home/ubuntu#
```



```
Terminal File Edit View Search Terminal Help
root@ubuntu:/home/ubuntu
Bluetooth: RFCOMM TTY layer initialized
Bluetooth: RFCOMM socket layer initialized
Bluetooth: RFCOMM ver 1.11
128.642583 usb 2-1: new high-speed USB device number 4 using ehci-pci
128.642593 usb 2-1: New USB device found, IdVendor=2201, IdProduct=012c
128.642598 usb 2-1: New USB device strings: Mfr=1, Product=2, SerialNumber=3
128.642603 usb 2-1: Product: VUB300-1.20
128.642607 usb 2-1: Manufacturer: Elan Digital Systems
128.642570 usb 2-1: SerialNumber: 000000224001
128.647108 usb 2-1: probing VID:PID(2201:012C) Elan Digital Systems VUB300-1.20 000000224001
128.647107 usb 2-1: vub300 testing BULK OUT EndPoint(0) 01
128.647109 usb 2-1: vub300 testing BULK IN EndPoint(1) 01
128.647171 usb 2-1: vub300 testing BULK OUT EndPoint(2) 02
128.647173 usb 2-1: vub300 testing BULK IN EndPoint(3) 02
128.647175 usb 2-1: vub300 LARGE packets using EndPoints 01 01 02 02
128.647667 usb 2-1: operating_mode = 100s, 4-bit, 48 Mhz with 512 byte USB packets
[ 128.648415] usb 2-1: USB vub300 remote SDIO host controller[0]connected with SD/SDIO card inserted
[ 122.065939] usb 2-1: exceeding card's volts
[ 122.066179] usb 2-1: NO host QUIRKS for this card
[ 122.180021] mmc1: new high speed SDIO card at address 0001
root@ubuntu:/home/ubuntu#
```

4. Type “cd /usr” and then “insmod wlan_mt7663_sdio.ko” to enable WiFi function of EUT.

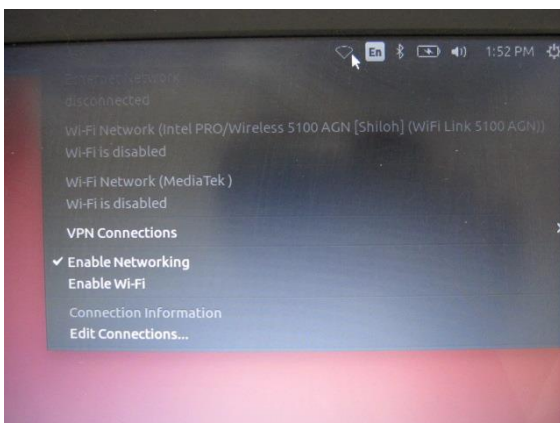


```
root@ubuntu:/usr# ifconfig lo
TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:0 (0.0 B) TX bytes:0 (0.0 B)

Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
inet6 addr: ::1/128 Scope:Host
UP LOOPBACK RUNNING MTU:65536 Metric:1
RX packets:5476 errors:0 dropped:0 overruns:0 frame:0
TX packets:5476 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:405904 (405.9 KB) TX bytes:405904 (405.9 KB)

root@ubuntu:/usr# ls
bin          sbin
binutils.ko share
games       src
include     start_console.sh
lib         ubuntu_openssh
local      WIFI_Non-Signaling_Test_Tool_User_Guide
locale     wlan_mt7663_sdio.ko
MTX_ROOTS_User_Manual_v1.24.pdf
root@ubuntu:/usr# insmod wlan_mt7663_sdio.ko
root@ubuntu:/usr#
```

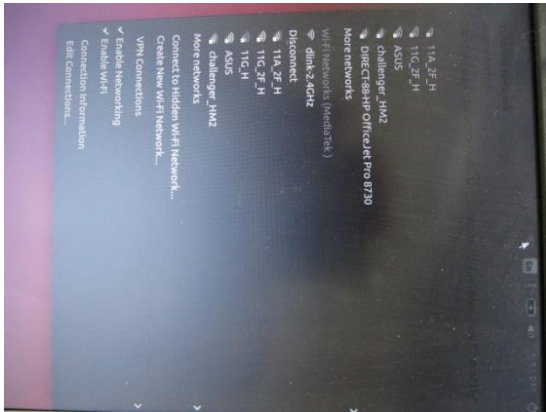
5. Link to AP with another PC or NB through Ethernet cable, open DHCP function in it and record the IP address.
6. Click WiFi icon on upper-right corner on Linux and disable WiFi.



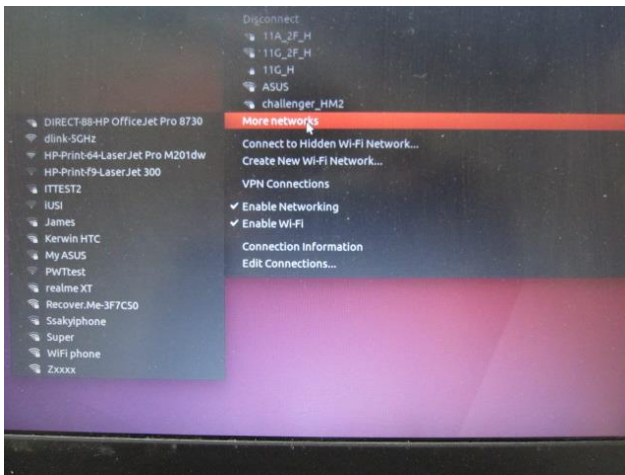


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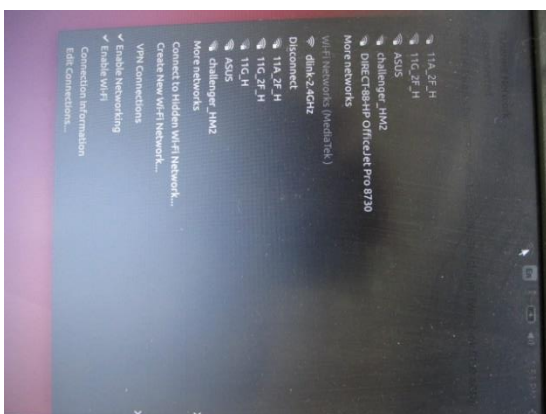
7. After disabling WiFi, then enable Wi-Fi, and Wi-Fi Networks (Intel....) and Wi-Fi Networks (MediaTek) would be visible. The Wi-Fi Networks (MediaTek) is device name of EUT.



8. Select the SSID you would link to by Wi-Fi Networks (MediaTek).



9. Click Connection Information, check the IP address and record it.



10. Copy iperf tools for Linux on Linux Desktop and then use the command below to copy the tools in usr file.

```
cp /home/ubuntu/Desktop//iperf /usr/
```



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11. Use the command below to install the tools in cd /usr path.

```
apt install iperf
```

12. Enter the command below.

```
chmod 777 iperf
```

13. Enable the function for possible application as below on the 2 PCs or NBs.

```
iperf client side
```

```
iperf -c IP -t 10000 -i 1
```

```
iperf server side
```

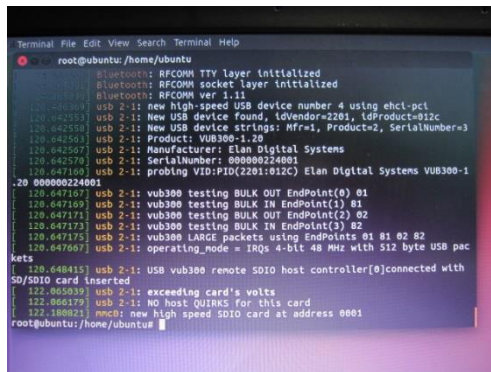
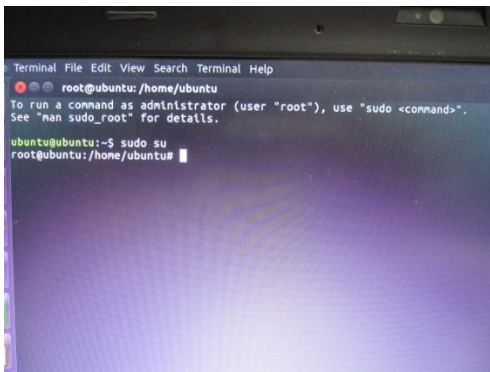
```
iperf -s -i 1
```

14. Ping function is also usable and ctrl+c could stop the ping function.

```
ping IP
```

3. cTX/RX (EDR-BT2.0)

1. Boot up PC or NB with the flash installed Linux OS.
2. 5V for EUT from the power supply.
3. Type “sudo su” on Terminal in Linux to get root authority. EUT could be controlled if “mmc0: new high speed SDIO card at address 0001” is shown after typing “dmesg.”



4. Copy “btmtksdio_user.ko” file onto Linux Desktop and use the below command to copy “btmtksdio_user.ko” in the “usr” file.
`cp /home/ubuntu/Desktop/btmtksdio_user.ko /usr/`
5. Search “BT device” by the below command.
`modprobe hci_uart`
`insmod btmtksdio_user.ko`
6. Pair EUT to the BT device to be linked as shown below.



7. After pairing, check the MAC address of the BT device in Bluetooth Settings.
8. Use the command “hciconfig” to check the hci number of EUT. For each number shown “Bus:



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SDIO”, it would be the one of EUT.

```
root@ubuntu: /usr
hci1: Type: BR/EDR Bus: SDIO
BD Address: 00:00:40:76:63:01 ACL MTU: 1021:6 SCO MTU: 244:4
UP RUNNING
RX bytes:764 acl:0 sco:0 events:56 errors:0
TX bytes:0 acl:0 sco:0 commands:56 errors:0

hci0: Type: BR/EDR Bus: USB
BD Address: 0C:60:76:87:4A:3C ACL MTU: 1021:8 SCO MTU: 64:1
UP RUNNING
RX bytes:3326 acl:0 sco:0 events:68 errors:0
TX bytes:3164 acl:0 sco:0 commands:48 errors:0

root@ubuntu:/usr# hcitool -i hci1 scan
Scanning ...
48:FD:A3:05:1E:57 n/a
BE:EF:BE:EF:00:01 n/a
D4:6D:6D:CB:CC:DC TWN25361-18980
80:19:34:CB:EF:F5 TWN24308-15747
8C:85:90:4F:2F:06 Johnny's MacBook Pro
root@ubuntu:/usr# hcitool -i hci1 scan
Scanning ...
BE:EF:BE:EF:00:01 n/a
80:19:34:CB:EF:F5 TWN24308-15747
D4:6D:6D:CB:CC:DC TWN25361-18980
```

9. Replace MAC (such as B8:D5:0B:2E:30:48) and hci number (such as hci1) with the actual ones in the below command and the ping function with BT link would be enabled.
while [-z `pidof l2ping`]; do sudo l2ping -i hci1 B8:D5:0B:2E:30:48; sleep 3; done



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4. Antenna Trace Design

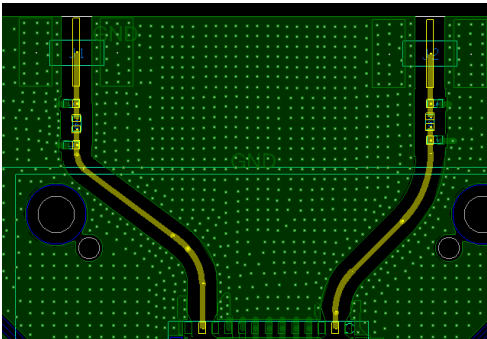
WLAN WiFi chain0/chain1

Top layer

Trace length

WiFi chain0 (956.66mils)

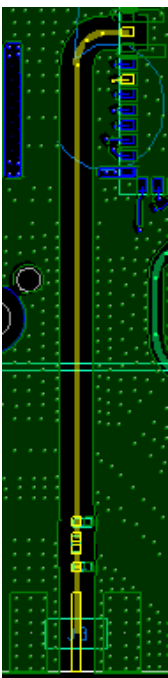
WiFi chain1 (871.31mils)



WLAN BT

Top layer

BT_ANT (1425.34mils)





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RF traces width : 17.5 mils, spacing 35 mils

PCB Stack-up for reference

PCB stack (1-2-1) as below:

Layer	Thickness (mil)	DK
Solder Mask	0.7	4.1
L1	1.6	
P.P.	10	4.19
L2	1.4	
Core	28.44	4.21
L3	1.4	
P.P.	10	4.19
L4	1.6	
Solder mask	0.7	4.1
Total	55.84	

Total Thickness: 55.1mils +/- 10% (1400 um +/- 10%)

*Note : The thickness of Solder Mask on top side is necessary to be controlled within 25um



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The Land Pattern and Dimensions should be compliance with USI's Standard PCB Design. The characteristics of products may vary depending on the pattern drawing method, grounding method, land dimensions, land forming method of the NC terminals and the PCB material and thickness. Therefore, be sure to verify the characteristics in the actual set. When using non-standard lands, contact Universal Global Scientific Industrial Co., Ltd. Beforehand.

ARISTOTLE
 ENTERPRISES INC. Specifications

RFA-25-C53-B32C255V2

Specifications

Frequency	2400-2500 MHz	5150-5875 MHz
Peak gain	3.5 dBi	5 dBi
VSWR	2.0 : 1 Max.	2.0 : 1 Max.
Polarization	Linear, vertical	
Impedance	50 Ω	
Connector	RP SMA PLUG	

Environment & Mechanical Characteristics

Temperature	-10°C to +55°C
Humidity	95% @ 25°C



USI uses various test mode programs for test set up which operate separate from production firmware. Host integrators should contact USI for assistance with test modes needed for module/host compliance test requirements.

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.



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5. Regulatory

This module is intended for OEM integrators under the following conditions:

1. Ensure that the end-user has no manual instructions to remove or install module.
2. This module is certified pursuant to Part 15 rules section 15.247, 15.407 and RSS-247.
3. This module has been approved to operate with the antenna types listed below, with the maximum permissible gain indicated.

Frequency Band	Antenna Type	Model Number	Gain(dBi)
2400-2483.5MHz; BT	Dipole	RFA-25-C53-B32C255V2	3.5
5150-5850MHz			5

US

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



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FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

While the 2 conditions above are met, further transmitting tests won't be required. However, the OEM integrator shall still meet those additional compliance tests for the end products with the module installed.

This module has been approved under stand-alone configuration.

OEM integrator has to limit the operation channels in channel 1-11 for 2.4GHz band.

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: COF-WMBACMT63". The grantee's FCC



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ID can be used only when all FCC compliance requirements are met.

The end product shall bear the following 15.19 statement: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed with 20 cm is maintained between the antenna and users in mobile or fixed applications.
- 2) The Antenna for Module (**COF-WMBACMT63**) is detachable and the maximum antenna gain allowed for use with this device is 3.5 dBi@2.4GHz band & 5dBi@5GHz band.
- 3) The transmitter module may not be co-located with any other transmitter or antenna.
- 4) OEM integrators Must demonstrate SAR tests and meet compliance before end-product with module (**COF-WMBACMT63**) marketed in portable application.

While the 2 conditions above are met, further transmitting tests won't be required. However, the OEM integrator shall still meet those additional compliance tests for the end products with the module installed.

OEM integrators Must demonstrate Part 15B test and meet compliance before end-product with module (**COF-WMBACMT63**) marketed.



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Canada

This device complies with ISED's licence-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareil est conforme aux RSS de ISED. Son utilisation est soumise aux deux conditions suivantes: (1) Cet appareil ne doit pas causer d'interférences nuisibles et (2) cet appareil doit accepter toutes les interférences reçues, y compris celles pouvant entraîner un fonctionnement non souhaité.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet appareil et son (ses) antenne (s) ne doivent pas être co-localisés ou utilisés conjointement avec une autre antenne ou un autre émetteur.

Radiation Exposure Statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition au rayonnement ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à une distance minimale de 20 cm entre le radiateur et votre corps.

This device is intended only for OEM integrators under the following conditions: (For module device use)

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

While the 2 conditions above are met, further transmitting tests won't be required. However, the



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OEM integrator shall still meet those additional compliance tests for the end products with the module installed.

Cet appareil est destiné uniquement aux intégrateurs OEM dans les conditions suivantes: (Pour une utilisation avec un appareil de module)

- 1) L'antenne doit être installée de manière à ce qu'il reste 20 cm entre l'antenne et les utilisateurs, et
- 2) Le module émetteur ne peut pas être co-localisé avec un autre émetteur ou une antenne.

Bien que les 2 conditions ci-dessus soient remplies, des tests de transmission supplémentaires ne seront pas nécessaires. Toutefois, l'intégrateur OEM doit toujours satisfaire à ces tests de conformité supplémentaires pour les produits finaux avec le module installé.

IMPORTANT NOTE:

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

NOTE IMPORTANTE:

Si ces conditions ne peuvent pas être remplies (par exemple, certaines configurations d'ordinateurs portables ou la co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considérée comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera responsable de la réévaluation du produit final (y compris de l'émetteur) et de l'obtention d'une autorisation distincte du Canada.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC:10293A-WMBACMT63".

Étiquetage du produit final

Ce module émetteur est uniquement autorisé à être utilisé dans un appareil où l'antenne peut être installée de manière à ce que 20 cm puissent être maintenus entre l'antenne et les utilisateurs. Le



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produit final doit être étiqueté dans une zone visible avec les informations suivantes: “Contient le module d'émission IC: 10293A-WMBACMT63”.

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Informations manuelles à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir à l'utilisateur final des informations concernant la procédure d'installation ou de suppression de ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations / avertissements réglementaires requis, comme indiqué dans ce manuel.

This radio transmitter [IC: 10293A-WMBACMT63] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Frequency Band	Antenna Type	Model Number	Gain(dBi)
2400-2483.5MHz; BT	Dipole	RFA-25-C53-B32C255V2	3.5
5150-5850MHz			5

Le présent émetteur radio [IC: 10293A-WMBACMT63] a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.



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Frequency Band	Antenna Type	Model Number	Gain(dBi)
2400-2483.5MHz; BT	Dipole	RFA-25-C53-B32C255V2	3.5
5150-5850MHz			5

The device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

Les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux.



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Japan



W52/W53 屋内使用限定ただし登録局に接続される場合は除く